SMITH

The frequency and character of the frog parasites in this region

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THE FREQUENCY AND CHARACTER OF THE FROG PARASITES IN THIS REGION

BY

ARTHUR LLOYD SMITH

THESIS

FOR

DEGREE OF BACHELOR OF ARTS

IN

GENERAL SCIENCE

COLLEGE OF SCIENCE

UNIVERSITY OF ILLINOIS

PRESENTED JUNE 1910

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THIS IS TO CERTIFY THAT THE THESIS PREPARED UNDER MY SUPERVISION BY

ARTHUR LLOYD SMITH

ENTITLED THE FREQUENCY AND CHARACTER OF THE FROG PARASITES IN THIS REGION.

IS APPROVED BY ME AS FULFILLING THIS PART OF THE REQUIREMENTS FOR THE

DEGREE OF BACHELOR OF ARTS

IN GENERAL SCIENCE

Henry B. Ward
Instructor in Charge.

APPROVED: Henry B. Ward

HEAD OF DEPARTMENT OF Zoology.

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Statistical and Technical Data.

The collecting of material for the investigation of the frequency and character of the frog parasites of this region, was conducted in Champaign County, of the State of Illinois, during the months of September and October, 1909. Owing to the numerous ponds, which afford an excellent breeding place for frogs, surrounding the immediate vicinity of Urbana, the collecting was done in this district. Many other swamps and ponds were visited in different parts of the township, but apparently at that season, they were not inhabited by frogs, as I failed to collect any specimens from these regions. The districts where the collections were made, were located in swamp and marsh lands, these lands being portions of the terminal glacial moraine of the early Wisconsin ice invasion. The land is rough and not well drained, and the entire territory is a succession of small ponds and stagnant streams. The beds of these ponds and streams are not gravel, but a heavy black deposit of decayed vegatation, and sewage. The ponds in majority have no intake or out-let, and are typical stagnant bodies of water. There is a certain amount of surface drainage into these places, which comes from districts, very questionable as regards their

sanitation.

As the frogs were collected they were taken to the laboratory and placed in heavy glass jars, containing deep well water, having a high percentage of mineral matter. The specimens were kept in this environment for a period not exceeding four weeks from time of capture, the water in the jars being changed at least twice a week. No food was given the frogs except that, which they might derive from the fresh water.

Before the specimens were examined, they were chloroformed in a small bell jar, containing a cotton helment, staurated with the anesthetic. Each specimen was opened by an abdominal incision and a careful examination made of the body cavity, muscles, and the various organs. Two classes of parasites were found, namely, trematodes and nematodes. As the trematodes were taken from the body, they were placed in a vial containing distilled water. This vial was vigorously shaken for about two or three minutes for each collection of trematodes; the violent shaking causing the specimens to lose vitality and straighten out to their fullest extent, the object of this process being evident for their future study. After this technique was performed the specimens were killed in corrossive sublimate containing one per cent of glacial acetic

acid. When the killing process was completed, the specimens were carried thru a series of alcohols, 35 %, 50 %, 70 %, and 85 %, being used respectively, the specimens being preserved in 85 % alcohol, as the final treatment.

The nematodes were killed in 70 % alcohol and 10 % glycerine, the solution being heated to about 90° C., before the specimens were treated. Afterwards they were preserved in the same solution.

Three different genera of frogs were examined for parasites, namely, Rana pipiens, Rana clamitans, and Acris gryllus. Following is the report of the examination of the different frogs, in the order of examination, naming the genera and species, sex of the frog examined, the classes of parasites taken from each host, the number of individual parasitic infections, and the location of the infection.

Table of Trematodes

Number	Name	Sex	Trematodes	Place	Condition
1	R. P.	Male	1	Bron.	Free
2	R. C.	Male	3	Lungs	Free
3	R. P.	Female	1	Lungs	Free
4	R. P.	Female		no infection	
5	A. C.	Male		no infection	
6	A. C.	Male		no infection	
7	R. P.	Female		no infection	
8	A. C.	Male		no infection	
9	A. C.	Male		no infection	
10	R. P.	Female	1	Stom.	Fastened
			25	Lungs	Fastened
11	R. P.	Female		no infection	
12	R. P.	Male		no infection	
13	R. P.	Female	1	Stom.	Fastened
			7	Lungs	Fastened
14	R. P.	Male		no infection	
15	R. P.	Female	2	Larynx	Fastened

Table of Trematodes

Number	Name	Sex	Trematodes	Place	Condition
16	R. P.	Female	28	Lungs	Fastened
17	R. P.	Female		no infection	
18	R. P.	Female		no infection	
19	R. P.	Male	1	Lungs	Fastened
		Total	70		

Abbreviations

R. P.	Rana pipiens
R. C.	Rana clamitans
A. C.	Acris gryllus
Bron.	Bronchii
Stom.	Stomach

Table of Nematodes

Number	Name	Sex	Nematodes	Place	Condition
1	R. P.	Male		no infection	
2	R. C.	Male		no infection	
3	R. P.	Female	34	Lungs	Free
			1	B. C.	Free
4	R. P.	Female		no infection	
5	A. C.	Male	2	Lungs	Free
6	A. C.	Male		no infection	
7	R. P.	Female		no infection	
8	A. C.	Male		no infection	
9	A. C.	Male	1	B. C.	Free
10	R. P.	Female	15	B. C.	Free
11	R. P.	Female		no infection	
12	R. P.	Male		no infection	
13	R. P.	Female	5	B. C.	Free
14	R. P.	Male		no infection	
15	R. P.	Female	11	B. C.	Free

Table of Nematodes

Number	Name	Sex	Nematodes	Place	Condition
16	R. P.	Female	4	B. C.	Free
17	R. P.	Female		no infection	
18	R. P.	Female		no infection	
19	R. P.	Male	3	Lungs	Free
			5	B. C.	Free
		Total	81		

Abbreviations

R. P.	Rana pipiens
R. C.	Rana clamitans
A. C.	Acris gryllus
B. C.	Body cavity

From the above report it is evident that the only organs infected were the lungs and the stomach. The body cavity was frequently infected by nematodes. The entire data show that sixty-eight trematodes were taken from the lungs of eight specimens of frogs, two trematodes were taken from the stomachs of two specimens, thirty-nine nematodes were taken from the lungs of three specimens, and forty-two nematodes taken from the body cavities of seven specimens; making a total number of seventy trematodes, and eighty-one nematodes, taken from ten infected frogs out of the ninteen examined.

The general data shows that out of ten frogs infected, five frogs were male, and five were female. The male frogs showed far less infection as to numbers of parasites, than the females. From the five infected male frogs, five trematodes and eleven nematodes were taken, while from the same number of infected female frogs, sixty-five trematodes, and seventy nematodes were taken. As a result of this investigation it seems apparent that the greatest infection was among the females, both sexes being taken from approximately the same ponds, within a very limited area. From the exterior, the frogs showed no signs of infection, the infected frogs being in the

same apparent condition of health, as those which were not infected. The majority of the trematodes which were found in the lungs of the specimens, had apparently little effect upon the working conditions of these organs, as the lungs in all of the infected frogs were in a healthy condition.

The Lung Parasite of the Frog.

The material used in this investigation was procured from the ponds and streams surrounding the immediate vicinity of the cities of Champaign and Urbana, Champaign County, State of Illinois. Ninteen frogs were collected and examined, the material collected for investigation being killed in corrosive sublimate and acetic acid, and preserved in eighty-five per cent alcohol. From these ninteen specimens of frogs collected for examination, eight specimens were found to be infected by the lung parasites described in this discussion. A total number of sixty-eight specimens of the lung parasites were obtained; three specimens being taken from the lungs of one specimen of Rana clamitans, and the remaining sixty-five specimens from the lungs of seven specimens of Rana pipiens.

A careful examination of these sixty-eight lung parasites, showed them to be very similar structurally to specimens described by Henry S. Pratt, as Ostiolum formosum.

The parasites are elongated animals, the posterior end being oval and blunt, the anterior end tapering to a slightly sub-terminal oral sucker. The widest portion of the body is located in the anterior third of the posterior half of the

specimen. Ten specimens were measured and an average made of the various measurements, these averages being used as the ultimate calculations in the description of the specimens.

A cross section thru the body is elliptical, the measurements averaging 0.42 mm. in thickness. The epidermal layer of the body is covered with short, stout spines which point posteriad.

The acetabulum is very minute measuring 0.05 mm. in diameter. This organ is situated about the middle of the posterior third of the anterior half of the specimen, and because of the apparent weakness of the muscles that should control its function, I do not believe that it is an active organ, but that it is a rudimentary form of an active organ found in other genera of trematodes.

The length of the specimens examined by me ranged from 4.16 mm. to 6.46 mm., while those examined by Pratt ranged from 7 to 10 mm. in length. The average width in the widest region of the body was 0.81 mm. The specimens examined by Pratt averaged 1.5 mm. in the widest region. The position of the broadest regions of the body of the specimens examined by me, corresponded to the position as recorded in the description by Pratt.

The oral sucker is a round hollow organ, slightly sub-terminal, surrounded by a heavy musculature which is capable of functioning it as an active organ. I found many of my specimens fastened to the inner lining of the lung cavity by the oral sucker, while the remaining portion of the body swung free. The average diameter of the oral sucker was found to be 0.18 mm. the variation in diameter in the different species ranging from 0.31 to 0.16 mm. The oral sucker opens into a cup-shaped pharynx whose diameter is 0.17 mm., the length of the pharynx being slightly greater than the diameter. At the left of the pharynx on the ventral surface of the body, and situated very close to it, is the genital pore. The genital pore is surrounded by a very well developed ring of musculature somewhat similar to that surrounding the oral sucker. Opening directly back of the genital pore is the cirrus sac. The cirrus sac continues posteriorly toward the anterior folds of the uterus, where it turns toward the anterior end of the ovary.

No oesophagus is present.

Immediately posterior to the pharynx two intestinal coeca branch off and continue towards the posterior end of the body. These coeca are continuous tubes and do not branch.

Including the pharynx they make up the digestive tract.

The excretory pore is situated at the posterior end of the body. Passing anteriorly from the pore, near the dorsal surface of the body, lies the median branch of the excretory vesicle. The excretory vesicle passes forward on the median dorsal line until it reaches the posterior testis where it turns and winds laterally around it. After reaching the posterior side of the ovary it branches into two crura.

The yolk glands are very well developed and consist of distinct bodies, irregular in form, and composed of several lobes. The yolk glands are situated immediately inside of the lateral body walls, and do not extend over the intestinal coeca in any specimens that I have observed. A small round duct leads from each mass of glands to the main ducts running longitudinally. The average diameter of the lobes of the yolk glands is 0.04 mm., and there seems to be but little variation of the individual lobes to the average calculation. In the specimens examined I found from five to nine yolk glands on each side of the specimens. In two instances a pair of these glands on one side were very closely associated with one another, and it was difficult to determine whether they were

one well developed gland or two small glands.

The receptaculum seminis is a large organ situated near the middle of the body and posterior to the ovary. It is more or less oblong in shape and somewhat larger than the ovary. It measures 0.38 mm. by 0.24 mm. It is constantly extended with spermatozoa occupying all the space between the anterior testis and the ovary. The ovary is a more or less oval shaped body and is developed almost to the size of the receptaculum seminis. The length of the ovary averages 0.31 mm. while the width is approximately two thirds the length. The ovary is located immediately anterior to the receptaculum seminis and nearer the ventral surface of the body, the plane of its position being oblique to the median line of the body. The anterior end of the ovary lies on the right side of the body, and the posterior end lies on the left side of the body.

Pratt states that in the specimens examined by him, the posterior end of the ovary was situated on the right side of the body, that is on the same side as the anterior testis, but in all the specimens I examined the posterior end of the ovary lies on the opposite side from the anterior testis, namely on the left side. I believe that the variation in the situation of some of these organs as described by Pratt and

myself is due to a misunderstanding on the part of Pratt, as to the dorsal and ventral sides of the animal. During my early studies of this trematode I found considerable difficulty in securing any " land marks " as it were, whereby I could actually depend upon a whole mount of the specimen in determining the dorsal and ventral sides. After making transverse sections of the animal I found several distinct features of its construction, which were manifest in whole mounts, some of these being very plain, while others were less so. I studied these out very carefully by studying the serial sections and the whole mounts, and I have classed my studies under six divisions, these being applicable to the study of whole mounts; altho it must be understood that these rules individually can not be applied to the same degree, to whole mount study, because of the variability in their significance.

Following are the results of my investigations, which led me to determine the dorsal and ventral sides of my specimens.

First to determine the dorsal and ventral sides of my cross sections, I located the acetabulum which is ventral, and made my further determinations from this known data.

(1) By cross section I found the posterior end of the ovary to lie in close proximity to the dorsal wall. In whole mount study this may be determined by focusing with the lens.

(2) In cross section the cirrus pouch near the ovary is dorsal. In very well prepared specimens of whole mounts free from eggs, the cirrus pouch may be rather indistinctly located.

(3) In cross section the uterine folds from the acetabulum to the anterior end of the ovary are largely ventral. This of course is evident in whole mounts.

(4) In cross section the intestinal crura are dorsal in the anterior end of the body. These crura may be seen in whole mounts.

(5) In cross section the acetabulum is ventral, and in whole mounts practically free from eggs, and perfectly cleared this organ may be clearly seen.

(6) In whole mounts, if the specimen is not twisted, the oral sucker opens upon the same side as the acetabulum, namely ventral.

Considering these data, I was able to determine the respective sides of my whole specimens, and my results are based upon these investigations.

The shell gland is situated at the anterior end of the ovary and is connected with the ovary by a short canal. This shell gland surrounds the beginning of the uterus.

The testes are two in number, located in the middle region of the body, posterior to the receptaculum seminis and the ovary. They are somewhat rectangular in form but in outline they are irregular. They average about 0.65 mm. in length, and 0.48 mm. in width. The testes are situated abliquely across the body, the anterior testis being on the right side and the posterior testis being qn the left side. Each testis appears to be supported by a thickening of the lateral walls of the animal body. With the exception of the folds of the uterus, the testes are the most prominent organs in the posterior half of these specimens.

The most prominent organ in the body of these specimens in point of size, is the uterus. The uterus begins at the öotype and proceeds posteriorly as a straight tube-shaped organ, until it reaches the receptaculum seminis where it folds into a longitudinal L-shaped structure in crossing this organ. From this point posteriorly the uterus fills the body with closely associated transverse folds. Anterior to the ovary these transverse folds of the uterus are generally confined within the lateral limits of the intestinal coeca, the uterus continuing as transverse folds until reaching the most anterior pair of yolk glands. From about this point the uterus continues

anteriad as a comparatively straight tube. The transverse folds of the uterus do not always continue as a single transverse fold thruout the entire width of the body, but in many cases the uterine tube is folded underneath, so that it gives the appearance of a broken fold. This folding of the uterus is not unifrom and the width of the uterine tube varies constantly, this variation being due to the difference in the quantity of eggs, contained in the various parts of the tube.

In the specimens examined by me the uterus was filled with small straw colored eggs, oval in shape, and uniform in outline. The eggs measured 0.026 mm. in length, and 0.015 mm. in width.

A brief survey of the details of the specimens examined by me are as follows.

Animals elongated with blunt posterior end, anterior end tapering to the oral sucker. Length 4.16 - 6.42 mm. Width 0.81 mm. Thickness 0.42 mm. Short, stout spines present. Acetabulum very minute, measuring 0.05 mm. in diameter. Oral sucker slightly sub-terminal, measuring 0.18 mm. in diameter. Genital pore at left of pharynx on ventral surface. Pharynx cup-shaped and about 0.17 mm. in width. Length of pharynx slightly greater than diameter. No

oesophagus present. Digestive tract composed of two crura which extend nearly to posterior end of body. Cirrus sac long. Excretory pore at posterior end. Excretory vesicle has long median portion, branching near anterior testis into two crura, which reach about to most anterior yolk glands. Yolk glands laterad of intestinal coeca, composed of lobes. About five to nine glands on a side. Receptaculum seminis centrally situated, well developed. Ovary more or less conical shaped organ situated diagonally across the body. Testes large well developed organs situated diagonally from each other near center of body. Anterior testis on right side of body. Uterus very voluminous, lying in transverse folds in the posterior two thirds of the body. Eggs oval and straw colored, measuring 0.026 mm. in length, and 0.015 mm. in width. Parasitic in the lungs of frogs in Illinois and Iowa.

These specimens of the lung parasites of the frog examined by me are very similar in structure to the specimens described by Pratt as Ostiolum formosum. It seems to me, after carefully studying Pratt's description of the Ostiolum formosum, and from the data collected by me on forms that closely resemble his description, that I have specimens similar in genus but not in species, to those described by Pratt. I have

refered in a preceeding paragraph that there is an apparent difference in the location of the anterior testis in relation to the posterior end of the ovary. Pratt claims that the posterior end of the ovary is on the right side, and the anterior testis is similarly located. I have found by careful observation that the specimens I possess have the anterior testis on the right side, but the posterior end of the ovary is on the left side. I also find that the excretory system in my specimens is dorsal and not ventral, while those specimens described by Pratt have a ventral excretory system. My specimens vary greatly in size, both the body and the organs. This variation may be due to the amount of flattening done to the specimens before measurements were taken. My specimens were flattened but slightly, and the bodies were well distended with eggs. I also find well marked spines on my specimens, which are short and stout, while the specimens described by Pratt have no spines. In the specimens described by Pratt he finds a larger number of yolk glands on each side of his specimens, than I find in mine. He cites from six to eleven on a side, while I find only from five to nine in the specimens examined. The eggs from specimens examined by Pratt are much larger than those examined by me. His measurements are 0.039 mm. in length,

and 0.017 mm. in width, while my measurements are 0.026 mm. in length, and 0.015 mm. in width.

I am aware of the fact that Pratt had but few apecimens with which to work, and that his method of fixing and preserving the material might have caused some difference in size, but considering these facts outside of the data, I believe I have enough evidence of variation to warrant me in believing I have a species somewhat different than the species described by Pratt as formosum.

Plate I

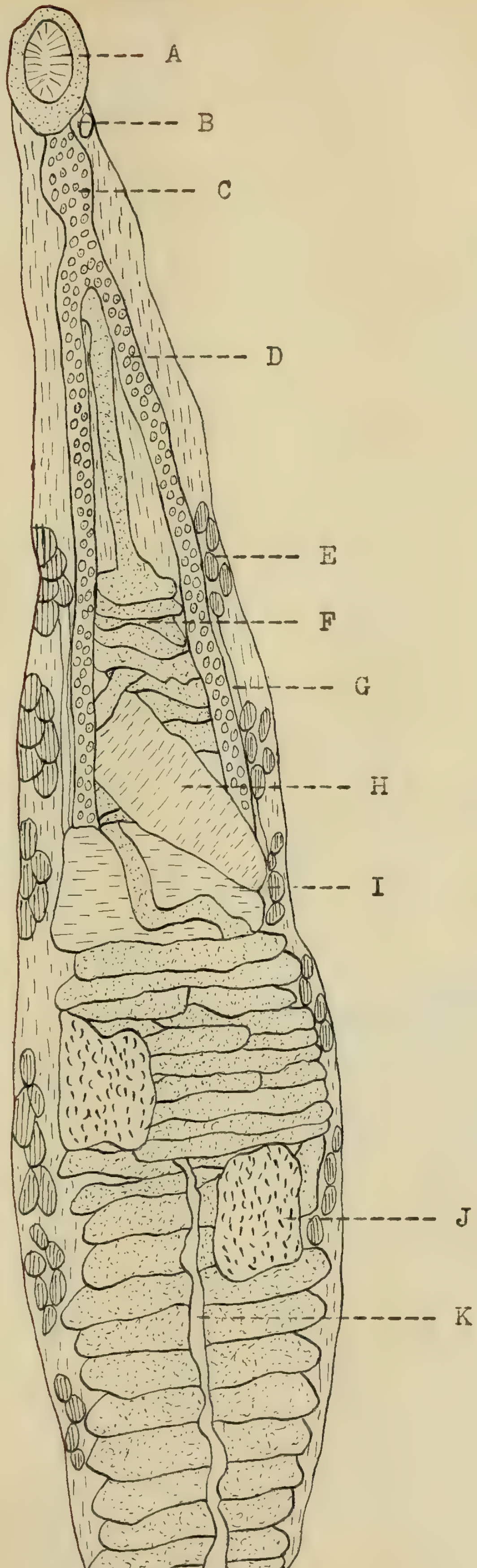

Plate I

References

A	Oral Sucker
B	Genital Pore
C	Pharynx
D	Intestinal Coeca
E	Yolk Glands
F	Uterus
G	Excretory Crura
H	Ovary
I	Receptaculum Seminis
J	Testis
K	Medio-dorsal Excretory Duct
L	Excretory Pore

Plate II

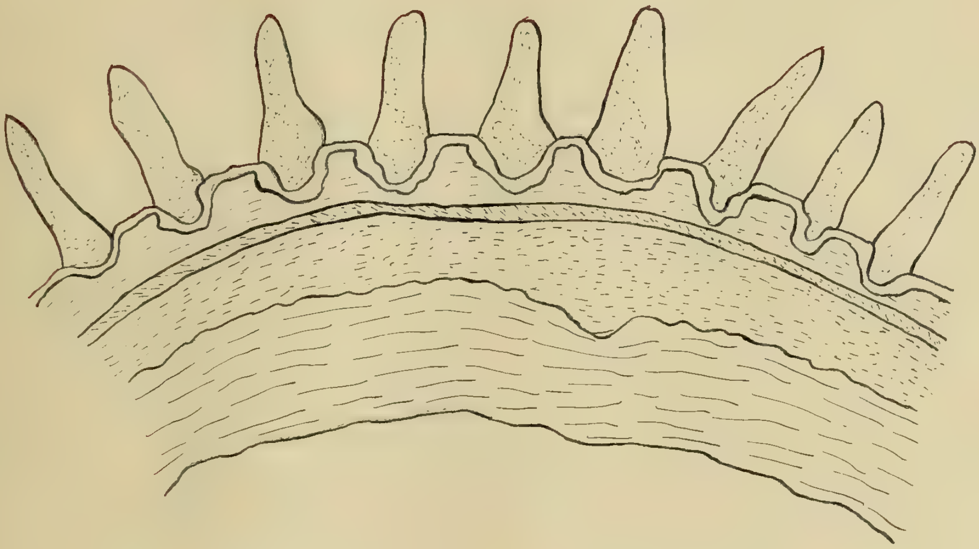

Plate II

Summary

This plate is a drawing of a cross section thru the body, showing epidermis and the nature and location of the spines, described in the discussion.

Trematodes of the Stomach.

The specimens described in this discussion were found in the stomachs of two of the frogs examined for parasites, specimens 10, and 13, respectively. The parasites were attached to the inner lining of the stomach, by the acetabulum, while the oral sucker and the remaining portion of the body were free. Both specimens were stained by Delafield's haematoxyn, and one specimen was mounted in toto, the other specimen was sectioned transversely. Both specimens were well filled with eggs, and the method used in killing and preserving the specimens, did not prove advantageous in the future study of the specimens. The technique used in caring for these specimens was not the best, owing to a lack of knowledge on my part, and consequently the histological conditions of the toto mount and the transverse sections, were not perfect, and a detailed study of the specimens could not be made with any certain degree of accuracy.

Following is a description of the specimens considering the most accurate determinations possible, the measurements being made with a high power, # 5, and owing to the lack of specimens no comparison of measurements is made.

The worms are elongated specimens, about 9 mm. in length, and 1.7 mm. in width in the widest region, without spines the posterior portion of the body tapering to a blunt rounded end. On the median mid-dorsal surface, near the anterior end is a large cup-shaped acetabulum, the outer edge of which is delicately notched. The acetabulum measures 1.7 mm. in diameter, and about 1 mm. in depth. Proceeding anteriad from the acetabulum, on the dorsal surface, extends an arm-like projection which terminates in the oral sucker. The genital pore is situated on the median line of this arm-like projection, about two thirds of the distance from the oral sucker to the acetabulum, or 1.7 mm. The oral sucker is a well developed organ, much smaller than the acetabulum, and cup-shaped in form, surrounded by a heavy musculature, measuring 0.51 mm. in diameter and 0.56 mm. in depth.

These worms are hermaphoditic, each specimen containing two testis and an ovary.

The ovary is a lobed organ, situated in the anterior part of the body, a short distance posterior to the acetabulum, and in front of the testes. The ovary is about 0.85 mm. in length, and 0.42 mm. in width, measuring the entire lobed structure as an entire organ. The shell gland and ootype lie immediately posterior to the ovary. The diameter of the

shell gland and ootype, in cross section, is about 0.17 mm. The testes are two in number, irregular in form and very well developed. They measure 0.68 mm. in length, and 0.51 mm. in width. They are not situated in a transverse plane, but lie one behind the other, on one side of the specimen, near the center of the body.

The uterus fills the entire body posterior to the acetabulum. It continues from about the region of the acetabulum as a comparatively straight tube to the genital pore, where it terminates. The uteri in the specimens I examined were well distneded with small straw colored eggs, oval in shape and regular in form. The eggs were deteriorated to such an extent that accurate measurements could not be made. No yolk glands could be located, so I concluded they must be very small if present.

Proceeding posteriad from the oral sucker is the digestive tract, which leaves the oral sucker as a straight regular tube, branching immediately posteriad to the sucker, into two crura, these crura continuing to the posterior end of the body as two straight tubes, without lateral branchings, one tube near the dorsal surface of the body and the other near the ventral surface of the body. The crura terminate in the anal opening at the extreme posterior end of the specimen.

No pharynx is present.

Following is a brief survay of the details discussed in the preceeding paragraphs.

Worms elongated, without spines, posterior portion of body tapers to a blunt end. Two suckers present, the acetabulum, and the oral sucker, the former lying on the mid-ventral surface of the body, cup-shaped in form, and well developed; the latter at the extreme anterior end, considerably smaller than the acetabulum. Genital pore in the anterior end of body and median. Worms hermaphoditic. Ovary lobed, situated posteriad to the acetabulum. Testes two in number lying on one side of the body, one behind the other. Uterus voluminous, filling body back of acetabulum, terminating at genital pore. Uterus filled with small, oval, straw colored eggs. No pharynx present. Digestive tract consists of two crura which extend entire length of the body. Digestive crura have no lateral branchings. Present in stomachs of specimens of Rana pipiens.

The following plate gives an illustrative description of the specimens heretofore discussed in this article.

From the above general data, which are lacking in details, and considering the very limited amount of material

available for study, and also the failure of the technique used to produce favorable conditions for a critical study, I find the amount of my knowledge of these forms insufficient to determine their genus and species.

Plate III

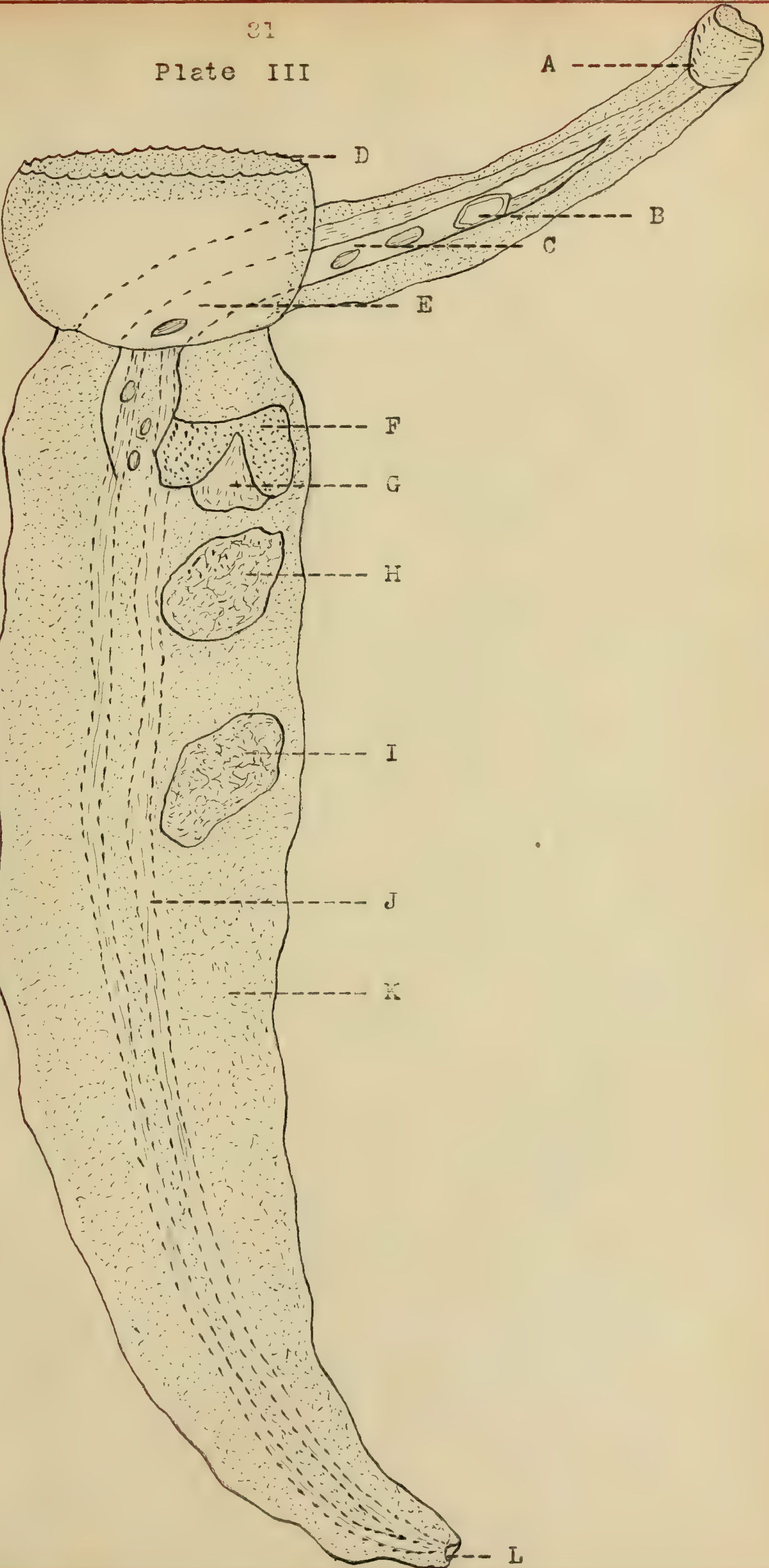

Plate III

References

A	Oral Sucker
B	Genital Pore
C	Eggs
D	Acetabulum
E	Uterus
F	Ovary
G	Ootype and Shell Gland
H	Testis
I	Testis
J	Intestinal Crura
K	Uterus Filled with Eggs
L	Posterior Opening

The Nematodes.

Out of the ninteen frogs examined, eight frogs were infected by nematodes, thirty-nine nematodes being taken from the lungs of three specimens of frogs, and forty-two nematodes taken from the body cavities of seven specimens, making a total in all of eighty-one nematodes.

A careful inspection of these forms, showed the presence of females only, no male forms being present in either the lungs or the body cavities. A careful study revealed the fact that all the forms were alike as far as species was concerned, there being two forms of females, adult forms and young females. The young female nematodes resembled the adult forms in all points of structure, the only difference being in their size. All nematodes taken from the lungs or the body cavities of these frogs, were free and not fastened.

Following is a description of the adult female specimen.

The body is long and cylindrical, the exterior surface being comparatively smooth. The average length of these adult specimens is 7.41 mm., while the average length of the young females is 3.8 mm.

The anterior end terminates in a circular mouth. Immediately posterior to the mouth begins a long tube-like oesophagus, which swells into two bulb-like structures a short distance from the mouth. Continuing from the most posterior bulb is a long cylindrical intestinal tube, which continues toward the posterior end of the body. The most important organ in the body in point of size is the uterus, which consists of a long tube, doubly folded, and opening into the genital pore, which is situated near the extreme end of the anterior half of the specimen. The uterus is filled with straw colored eggs, which measure 0.068 mm. in length, and 0.034mm. in width. The ends of the uterus lying adjacent to the genital pore, function as a vagina, and the eggs undergo partial development in these portions of the uterus.

The ovaries, two in number, consist of long tube-like structures, lying longitudinally in the center of the specimen, and they begin as fine thread-like filaments. The ovaries lie below and at one side of the uterine tube. The posterior end of the specimens end in a short spike-like structure, slightly curved, the terminal posterior end not being abrupt. The anal opening is a short distance anteriad to the posterior end.

Small glands are found in both the anterior and the posterior ends of the specimens.

The average diametrical measurements of the adult body, at different regions, are as follows. A comparison of the measurements of the young females is also made in the following paragraph.

In the oesophageal region the body measures 0.08 mm. In the young female the body measures 0.13 mm., in this region. At the genital pore the adult body measures 0.18 mm., and in the young female the body measures 0.14 mm. At the anal region, the adult body measures 0.14 mm., and in the young female the average measurement is 0.08 mm.

The accompanying plate shows the relative position of the body structures as found in the adult female.

From the above description I determine these specimens to be of the genus Hedruris, Nitzsch, but owing to the variations in measurements I believe I have a species somewhat different from the species described under this genus, as Hedruris androphora.

Plate IV

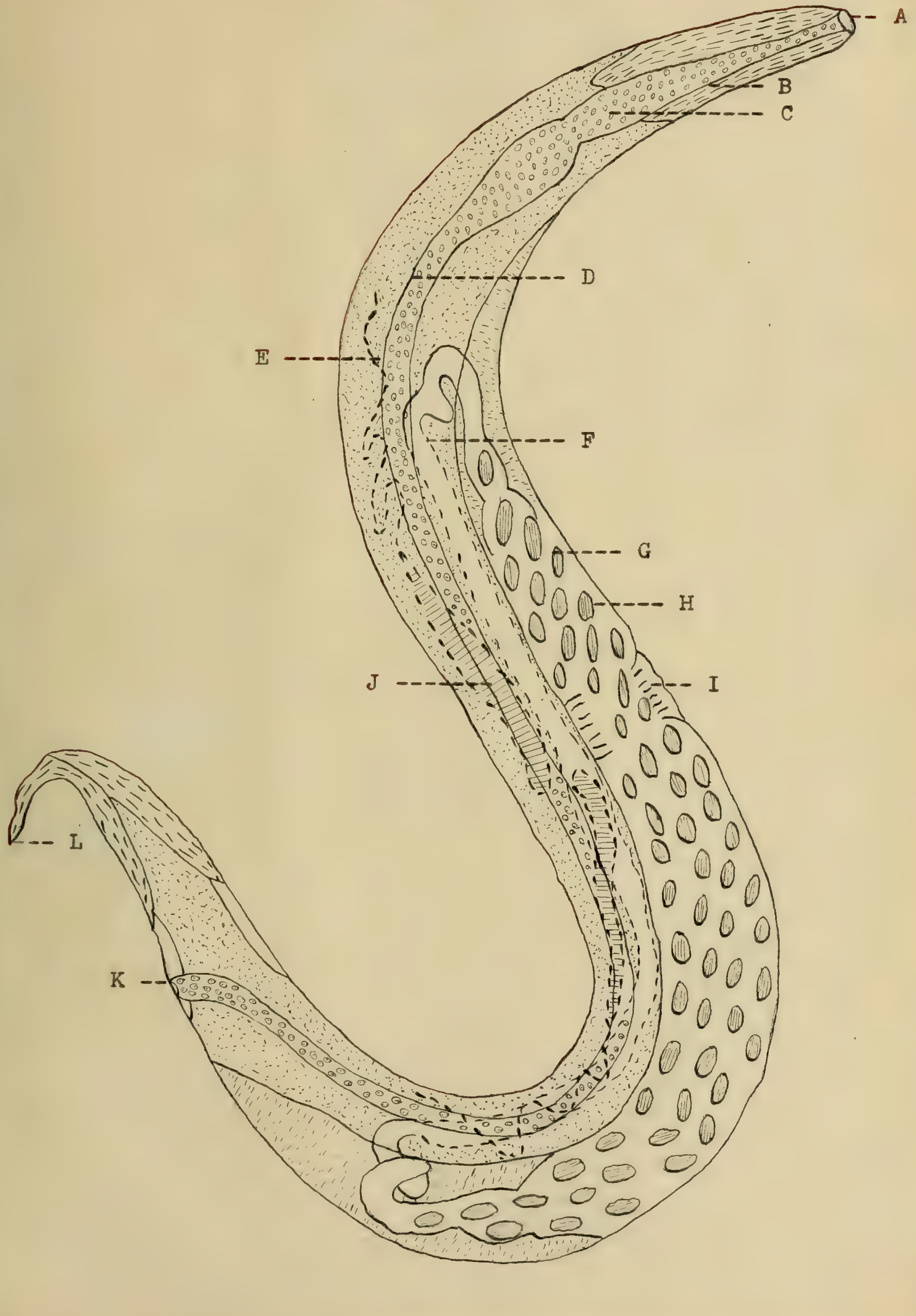

Plate IV

References

A	Mouth
B	Gland
C	Oesophagus
D	Intestinal Tube
E	Ovarian Filament
F	Uterus
G	Egg
H	Vagina
I	Genital Pore
J	Ovary
K	Anal Opening
L	Posterior End

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